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U. S. ARMY MEDICAL MUSEUM
ARMY AUTOPSY PROCEDURE

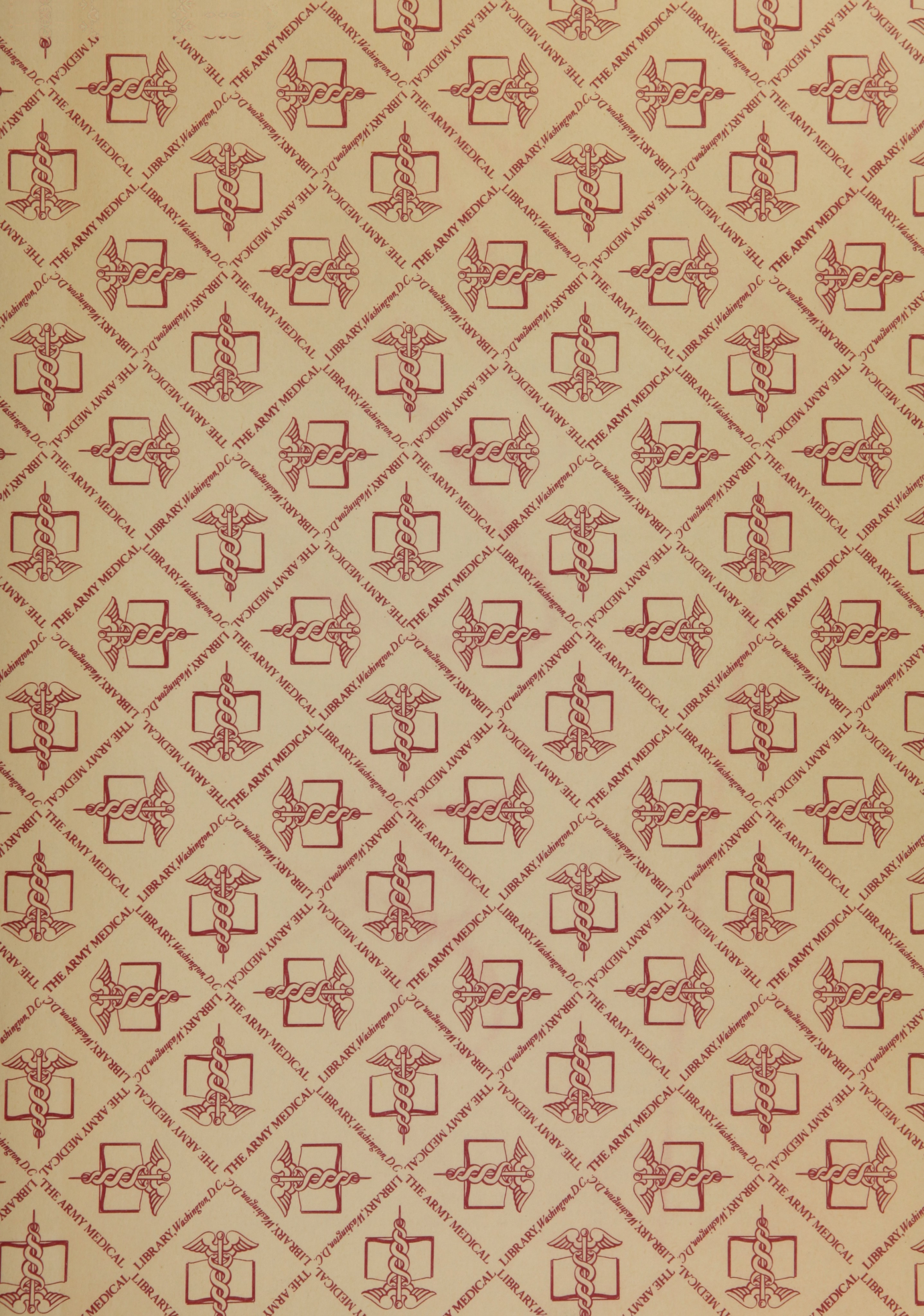
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ARMY AUTOPSY PROCEDURE

Prepared at the Army Medical Museum 1941

Simmons: "Laboratory Methods of the U. S. Army"
 Cattell: "Post-Mortem Pathology"
 Wadsworth: "Post-Mortem Pathology"
 Mallory & Wright: "Pathological Technique"

Circular Letter #1, O.S.G., Jan. 2, 1941, Section IV

Army Regulations as follows:-

- 40-310- Covers the preparation and shipment of specimens to laboratories.
- 40-410- The Army Medical Museum
- 40-590- Autopsies
- 600-550- Procedure in cases of violent death.

40-590

Autopsies.

- (1) An autopsy will be performed upon the body of any person dying in the military service when the commanding officer of the hospital or the surgeon of a station or command deems such procedure necessary, in order to determine the true cause of death and to secure information for the completion of military records.
- (2) Complete autopsy records of autopsies performed will be kept. A copy of the records of each case will be forwarded directly to the Curator, Army Medical Museum.

600-550

Par. 21. Investigation and report by Board of Officers.-a. General.

- (3) a. A Board of Officers will be required in case death is due or is suspected to be due to foul play, violent or unnatural causes, or when death is sudden from unknown causes, except death from wounds or injuries received in action.

- b. Post-mortem examination, when made.

(1) The medical member of the Board will, except as provided in (2) below, make, or cause to be made by another medical officer, a post-mortem examination in any case of death coming under the provisions of (a) above. When no medical officer is available to make such examination, the commanding officer is authorized to employ the services of a civilian physician to make the examination (authority to be the same as that for obtaining medical attendance when Army medical attendance is not available). (See AR 40-505) The original re-

port of the post-mortem examination will be attached to the Proceedings of the Board.

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(2) A post-mortem examination need not be made under the provisions of this subparagraph if a post-mortem examination has already been made under the provisions of paragraph 20, AR 40-590, or of paragraph 22 below, report of which is available to the Board.

22. Report of inquest by summary court in case of a person who dies, or is found dead, under circumstances which requires investigation.

- (a) When a person dies or is found dead at any post, camp, or station under the exclusive jurisdiction of the United States and the death is due or is suspected to be due to foul play, violent or unnatural causes, or death is sudden from unknown causes, except deaths from wounds or injuries received in action, the commanding officer will immediately designate and direct the summary court to investigate the circumstances attending death, to the end that the cause thereof may be determined and the person criminally responsible therefor may be brought to justice. The summary court will with the least practicable delay view the body of the deceased and summon and examine upon oath or affirmation such witnesses as may have knowledge of the cause and circumstances of the death. The summary court will warn every person testifying at the inquest who is accused or suspected that he is not required to give evidence incriminating himself and that any evidence or statement he gives may be used as evidence against him in the event of any further proceedings being instituted.

The commanding officer will direct a medical officer to make a thorough examination of the body of deceased and to appear as a witness at the inquest. In the event no medical officer is available, the commanding officer will employ a civilian physician (authority to be the same as that for obtaining medical attendance when Army medical attendance is not available; see AR 40-505) to make the examination. The civilian physician will also be summoned to appear as a witness at the inquest. The testimony of each witness will be reduced to writing and will be made under oath or affirmation and will, when not stenographically reported, be subscribed to and appended to the report of the inquest.

AR 40-590 gives authority to the surgeon to have an autopsy performed in any doubtful case. This includes all cases of unusual interest and gives permission to do an autopsy on any member of the military personnel. As a result of the existence of this Regulation there is no excuse for other than accurate diagnoses being reported as the cause of death on the Sick and Wounded card in the case of military personnel.

Such diagnoses as angina pectoris, myocarditis, heart block, etc. should no longer be accepted as primary causes of death. The diseases leading

up to their occurrence should be stated as the primary condition. Every medical officer, therefore, is liable to have to perform autopsies, and lack of special knowledge of pathology, or of local facilities for histological examination should not make him hesitate to do them. All that is necessary is a modest collection of instruments, some knowledge of the mechanics of the autopsy, and the ability to describe accurately. By forwarding to the Army Medical Museum, or the Corps Area Laboratory serving your Post, the clinical record, the autopsy findings and blocks of tissue in 10% formalin (4% formaldehyde), final study and interpretation of the case can be made.

The autopsy has additional significance in the Army over its function in civilian practice in that it can at times be of assistance in determining the line of duty status. When this is the case, its importance is very material, protecting the government, for example, in the case of an accidental death that has resulted from alcoholism on the one hand, or protecting the rights of the individual when the death was the result of an organic lesion not recognized clinically.

Deaths due to foul play or where the same is suspected and results of negligence, criminal or otherwise.

In civil life, investigations under these headings are held by coroners and coroner's physicians or by medical examiners under the direction of the Attorney General. AR 600-550 backed by the 113th Article of War established a dual system in which a summary court officer acts as a coroner and a coroner's physician is designated by the surgeon while, in addition, par. 21 requires a Board to determine the line of duty and protects the interests of the deceased and the government. Autopsies performed under these Regulations are essentially coroner's autopsies and should be made with that thoroughness which is required of this variety of examination. In such cases the medical officer must necessarily know something of the condition concerning the death of the deceased in order to determine exactly what type of examination should be made. It is not satisfactory, for instance, to simply examine the crushed body of a person killed in an automobile accident, - investigation should go far enough to ascertain the probability of intoxication or other disease at the time of the accident as well.

All autopsies under AR 40-590, by permission without invoking any regulation, or under 600-550, are autopsies within the purview of AR 40-410 and copies of the protocols should be promptly transmitted to the Curator, Army Medical Museum.

Autopsy protocols should always be accompanied by or have incorporated in them a summary of the clinical history which should be sufficiently clear to enable the actual cause of death to be determined. This is particularly true in the case of injuries and the data usually shown on the S & W card or a copy of that card should accompany the autopsy protocol. This data will enable the Army Medical Museum to file properly and to index the case under its proper heading, as suicide, homicide, accident due to automobile, etc. without additional correspondence.

As guides to the preparation of the autopsy protocol, and clinical abstract, outlines are attached. By following some such outline,

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pertinent data are not apt to be omitted. In performing an autopsy, due consideration for the final appearance of the body and the undertaker's duties will be borne in mind. It is difficult for the undertaker to embalm properly if the blood vessels to the head and extremities are not preserved intact.

FORM FOR AUTOPSY PROTOCOLS

See also "The Autopsy", p. 935, "Laboratory Methods of the U.S. Army"-Simmons 1935.

To facilitate coding, indexing, etc. at the Museum, prepare the front page as follows, typing only the underlined captions.

NAME OF HOSPITAL

NAME:

STATUS:

AGE:

SEX:

RACE:

NATIVITY:

ADMITTED:

date

DIED:

date, hour, place

AUTOPSIED:

date, hour, place

CLINICAL DIAGNOSES

1.

2.

3. etc.

PATHOLOGICAL DIAGNOSES

(Capitalize the significant ones)

VASCULAR SYSTEM:

RESPIRATORY SYSTEM:

SPLEEN:

GASTRO-INTESTINAL SYSTEM:

LIVER:

PANCREAS:

GENITO-URINARY SYSTEM:

BRAIN:

MISCELLANEOUS:

CLINICAL ABSTRACT:

Date of Admission

Complaints:

1. --
2. --
- etc.

Habits: - Alcohol, tobacco, narcotics, etc.

Family History: - List all information bearing on deaths, illnesses and hereditary tendencies.

Previous Personal History: - Including all illnesses, operation wounds, fractures, venereal infections and all personal history in general. List all services in Army or Navy.

Present Illness: - Onset of present illness with chronological abstract of illness.

Physical Examination: - Weight, height, temperature, pulse, respiration and blood pressure. List all positive findings by systems.

Laboratory and X-ray Findings:

Progress Notes: - To include abstract of patient's illness and hospitalization with major therapeutic measures, etc.

Date and hour of Death:

PROTOCOL

(General Note: - Describe fully the body as a whole and each organ, being as objective as possible and avoiding the use of pathologic terms and diagnoses so that your protocol will have an intelligent meaning to others who may later review it. Include size, weight, shape, colors, consistency and general description of capsule and cut surface as it pertains to each organ. List all departures from normal position and relationship. Describe fully all pathologic lesions that are recognized.

Examine each and every organ in the body and collect representative sections of each for future histologic studies, including muscle, bone and marrow.)

GENERAL: Approximate height, weight, age. Color, sex, condition as to development and nutrition.

Detailed description of exterior, beginning with hair and going to feet to include marks of identification, scars, wounds, condition of pupils, teeth, mucosae, deformities, condition of abdomen.

Superficial vessels and lymph nodes. External genitalia. Post mortem lividity.

PRIMARY INCISION: Subcutaneous fat, muscles, peritoneum, omentum, intra-abdominal fat, position and relations of abdominal viscera, adhesions, fluid, intra-abdominal and mesenteric lymph nodes. Height of diaphragm. Pleural fluid. Adhesions, Pericardium. Thymus. Thyroid, parathyroids. Larynx and pharyngeal structures.

LUNGS: Right - weight, relative size, consistence, pleura. Cut surface of each lobe. Bronchi, hilus (lymph nodes)
Left - same.

HEART: Weight, relative size. Epicardium, musculature, valve leaflets, endocardium, coronary arteries. Measurements of valve orifices and thickness of ventricular walls.

AORTA AND VESSELS:

SPLEEN: Weight, size, consistence, capsule. Cut surface, color, dry or moist, markings. Does pulp scrape?

LIVER: Weight, surface; section - consistence, color, markings. Gall bladder and ducts.

PANCREAS: Weight, consistence, cut surface.

SUPRARENALS: Size, cut surface.

GASTROINTESTINAL TRACT: Esophagus, stomach, intestines.

GENITOURINARY TRACT: Right kidney, weight, size, consistence. Capsule strips; subcapsular surface, cut surface cortical markings; pelvis, ureter.

Left kidney - same.

Bladder - distended? Mucosa, wall, seminal vesicles
Prostate and testicles, or uterus and adnexa.

HEAD: Scalp, calvarium dura (blood sinuses of dura), leptomeninges, fluid and exudate; cerebral vessels. Brain, convolutions and sulci, consistency, lateral ventricles. (Brain, without further sectioning, suspended in 10% formalin for future examination). Sinuses of skull, temporal bone.

CORD: Dura, fluid exudate, leptomeninges. Cut surface at different levels - (hardened with brain).

EAR: EYE: BONE MARROW: Ribs; shaft of femur. Bones and joints.

BACTERIOLOGICAL EXAMINATION: Consult "Laboratory Methods of U.S. Army"-Simmons, 1935. See pages 12 and 20.

CHEMICAL EXAMINATION: Consult "Laboratory Methods of U.S. Army"-Simmons, 1935 and Standard Texts on Medico-Legal Medicine. See pages 13-19 inclusive.

Name-

Rank-

Prosector-

NOTE: Give here your opinions and interpretations of your findings, especially as to pathogenesis.

DIRECTIONS TO OBTAIN

AUTOPSY MATERIAL FOR MICROSCOPIC EXAMINATION.

Prepared by Lt.Col.F. H. Foucar, M. C.
Technique modified at Army Medical Museum

No attempt will be made to indicate autopsy technique. Attention will be focused upon method of obtaining representative sections of viscera for microscopic examination.

Instruments needed

Knife, cartilage (33180):	2
Knife, amputating (33150):	1
Scissors, 8 in.straight, double blunt (34730):	3
Scissors,5.5 in.straight, double sharp (34740):	1
Forceps, tissue, 5.5 in.(32700):	4
Saw, amputating, Satterlee (34590):	2
Probe, 8 in. (34240):	1
Director, grooved (31735):	1

A sharp pointed meat knife, blade 2 in. wide at base; edge 10 in. long, may be purchased for about \$1.50; such a knife is essential to make cuts of the larger viscera.

When making cuts to obtain specimens for microscopic examination:
(a) The knives and scissors must be clean and sharp; the cuts must be made quickly and accurately; (b) Use a clean sharp knife; cut firmly and rapidly, having first decided where you want to cut.

HEART

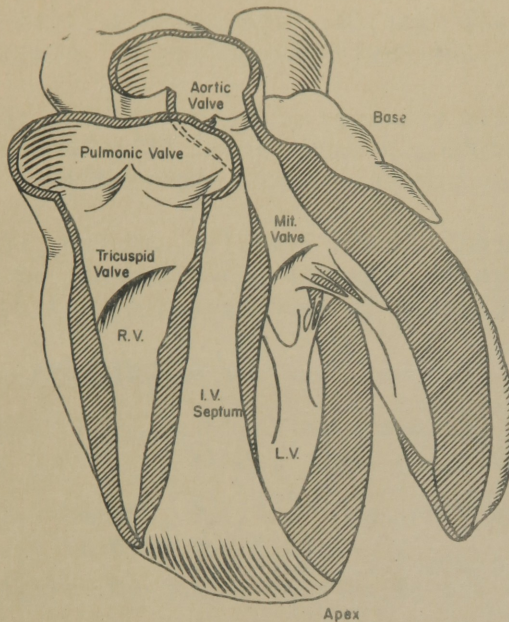


FIG. 1

Locate the interventricular septum by palpation. While the heart lies in situ slit the anterior wall of the right ventricle just below the pulmonary artery using knife or long scissors to make a small longitudinal incision through the wall of the right ventricle as close to the septum as possible. Follow the interventricular septum toward the base of the heart, thereby opening the pulmonic valve; and in the opposite direction, still keeping close to the interventricular septum, thereby opening the tricuspid valve. The right atrium may be opened by cutting between the openings of the superior and inferior venae carvae.

The left ventricle is opened by making a small slit on the opposite side of the septum from the initial one described above for the right ventricle. The cut is

continued toward the base of the heart opening the aortic valve orifice. Unless the pulmonic artery is cut close to its attachment, or dissected free from the aorta, this cut will be carried across the pulmonary artery. The same incision carried to the apex, close to the septum, will open a portion of the left ventricle. Locate the papillary muscles of the mitral valve. A clean cut from the end of the dissection carried thus far and between the papillary muscles, through the mitral ring will open that orifice. The left auricle may be opened by cutting between the left and right pulmonary vein orifices. Fig. 1.

Routine blocks of heart tissue should consist of a block each of the entire thickness of the left ventricle; right ventricle and of each atrium. The blocks should be so taken that a true cross section of a portion of the left main and right main coronary arteries is included. Wherever indicated multiple sections of diseased areas, such as infarcts, vegetative lesions on the heart valves, and thrombosed arteries should be submitted, labelled if necessary. Blocks should be about 1 cm. in thickness.

At the discretion of the prosector, the unopened, or opened, entire heart, fixed in formalin solution, should be sent to the Army Medical Museum, or designated laboratory, for further dissection and study.

LUNGS

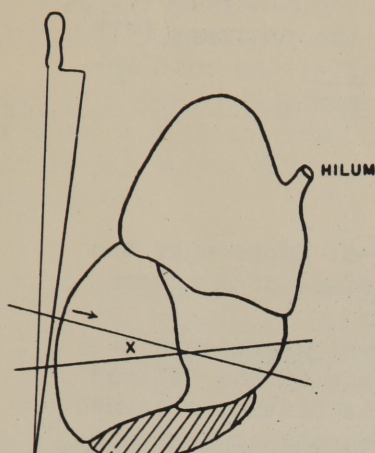


FIG. 2

Because of the elastic tissue, lungs are difficult to cut, unless consolidated or the site of neoplasia, primary or secondary, or marked edema. If a lung "cuts with ease" there must be considerable pathology.

Place the lung upon the soft-pine cutting board, costal surface uppermost, the rounded posterior border of the lung, underneath; locate the position of the hilum of the lung; press the lung down gently, using the palmar surface of the left hand. See Fig. 2.

Cut, using the large flat, sharp meat knife (10 in. blade, 2 in. broad at base, point sharp). A

lung cannot be cut properly without such a knife. Successive cuts may be necessary. The edge of the knife is directed toward the hilum of the lung. The cut surfaces expose: The main pulmonary blood vessels; the bronchi and their lobar branches, cut longitudinally.

For microscopic examination: Take representative sections from existing gross lesions, striving to include adjacent apparently normal parenchyma and overlying pleura. If there be no apparent gross pulmonary lesions, take a wedge-shaped section of the right lower lobe, as per diagram. If the sections of pulmonary tissue float, wrap them in gauze.

LIVER

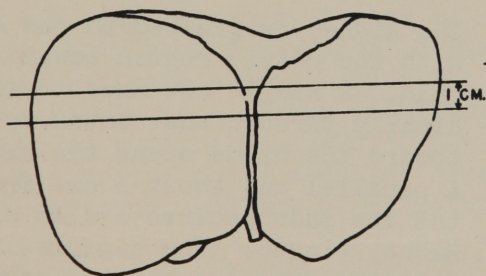


FIG. 3A

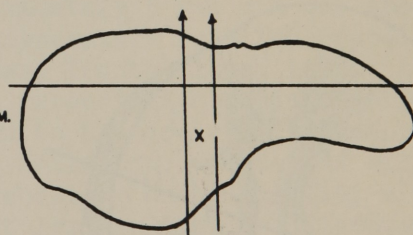


FIG. 3B

To cut the liver, use the long, sharp pointed, sharp edged meat knife. Cut down thru the anterior surface of the liver, transversely, removing a "slice" of parenchyma, approximately 1 cm. in width. Fig. 3-a. Cut thru one of the cut surfaces of the "slice". Fig. 3-b. The section obtained ("X"), will include: (a) The capsule of the liver; (b) Liver parenchyma.

The above routine cuts may be altered to fit in with existing gross liver lesions. In the event of hepatic neoplasia, primary or metastatic, obtain sections, each approximately 3 x 2 cm. in diameter, including: (1) The gross lesion, bordered with grossly uninvolved hepatic tissue; (2) Sections of liver tissue showing no gross neoplastic involvement.

Obtain representative sections (Fig.4):
 (1) From the head of the pancreas ("X");
 (2) From the body of the pancreas ("Y").
 Use the amputating knife; the cuts ap-
 proximately 1.0 cm. apart.

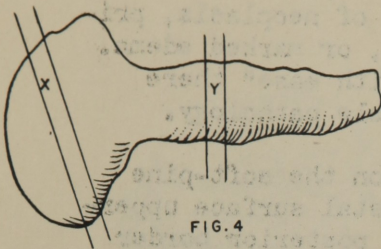


FIG. 4

PANCREAS

Fig. 5-a: Represents the
 outer surface of a spleen.

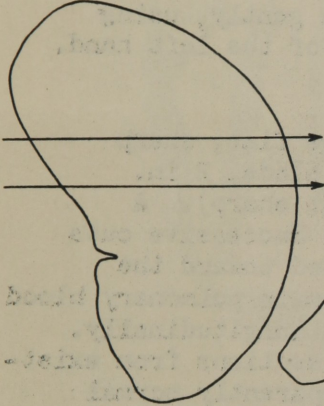


FIG. 5-a

Fig. 5-b: Represents a
 cut surface of the "slice"
 of splenic tissue, obtained
 as above; cuts approximate-
 ly 1.0 cm. apart. ("X") in-
 cludes: (1) The splenic
 capsule. (2) The splenic
 parenchyma with white and
 red pulp and trabeculae.

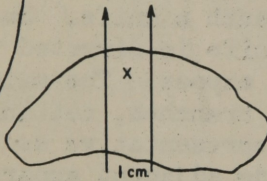


FIG. 5-b

SPLEEN

Diagram, Fig. 6, represents a
 kidney, cut sagittally. Cut sur-
 face, uppermost.

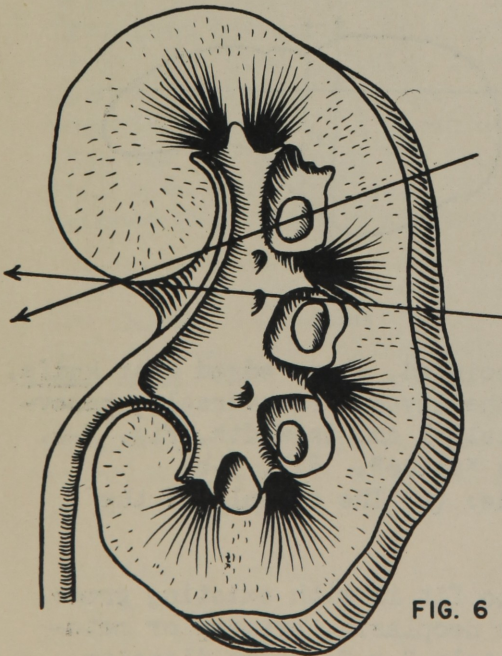


FIG. 6

KIDNEY

The kidney is grasped in one hand,
 with the pelvic region toward the
 palm. A single cut made longitu-
 dinally through the convex surface
 toward the hilus opens the kidney.
 A parallel cut about 1 cm. from
 the one made secures a slab of
 kidney tissue. The capsule is
 stripped from one-half of each
 organ and the surfaces described.

Remove for microscopic examination
 a wedge shaped piece, to include:

- (a) The renal capsule (not stripped)
- (b) The renal cortical parenchyma
- (c) The underlying pyramid of the kidney
- (d) The adjacent columns of Bertini
- (e) The papilla of the pyramid with the corresponding calyx.

SMALLER ORGANS

The smaller organs, adrenals, pituitary, thyroid, etc.: Weigh them and place them in formalin, in toto.

Weigh all organs before cutting, except the heart. Heart: Open the heart as indicated; wash the cavities free from blood and clots; cut off the aorta distal to the aortic valve; then weigh the opened, empty heart.

HOLLOW VISCERA

Methods of dissection will vary with the prosector and the suspected or observed lesions. Reference should be made to "Laboratory Methods of the U.S. Army"-Simmons, 1935, for details.

BRAIN

The ideal method of examining the brain and spinal cord is to fix the organs in 5-10 times the volume of neutral 10% formalin, suspending the brain by a loop of string which passes under the basilar vessels and is tied in place around the rim of the brain jar. Fix for a minimum of 5 days with at least 2 changes of formalin. The easiest method of examination after fixation consists in first dividing the midbrain, pons, medulla and cerebellum from the cerebrum by sectioning through the midbrain close to the cerebrum. Repeated coronal sections are then made through the cerebrum using one clean cut for each section, the sections being 1 cm. apart so that all major structures are examined. The closer to the vertical plane that one gets in repeated section, the less distortion there will be, resulting in closer approximation of relative size and shape of the component parts. If the brain requires sectioning prior to fixation, essentially the same method can be used. Blocks approximately 5 x 2 x 1 cm. should be taken and, if necessary, placed in separately labelled containers indicating their source-example: cortex, frontal lobe, left. A sharp knife and care should insure the preservation of leptomeninges with cortical blocks. Tissue submitted to the central laboratories should include routinely blocks of the following: cortex of all lobes of the brain; pons; medulla; cerebellum; basal ganglia; mid-brain; hippocampus, and any significant lesions that are discovered on dissection. The blocks from the brain stem should be complete cross sections. If the whole brain is to be shipped, it should first be thoroughly fixed as described above, wrapped in cotton or many layers of gauze saturated in formalin and packed snugly enough to avoid undue movement in transit.

GENERAL INSTRUCTIONS

Place all sections in 10% formalin; 1 part commercial formaldehyde to 9 parts of tap water. Use 1 or 2 Mason jars. After 24-28 hours in formalin, pour off the formalin; wash the sections in running tap water; trim the cut edges of the sections with a sharp knife (meat knife); thus reducing appreciably the bulk of the tissue obtained. Replace the sections in fresh 10% formalin, covering the sections with a piece of gauze in case any of the sections float (lung). Place label inside the jar. Seal the jar; label outside of jar, and mail to the proper authority, together with (under separate cover) a copy of the gross autopsy findings and a copy of the clinical history of the deceased.

BACTERIOLOGICAL EXAMINATION AT AUTOPSY

Col. C. G. Sinclair, M.C. Army Medical School

I. Routine bacteriological procedures.

- A. Heart's blood - all cases.
- B. Lung - all pneumonias.
- C. Bronchi and trachea when indicated.
- D. Pleural, peritoneal and pericardial fluids when indicated.
- E. Exudates when present.
- F. Spinal fluid, brain, and meninges when indicated.
- G. Urine and intestinal mucosa when indicated.
- H. Local lesions.

II. Methods.

1. Direct spreads, stained by Gram method except from heart blood.
2. Aerobic and anaerobic cultivation in infusion broth and thioglycollate tubes and on blood agar plates, and/or on other differential media, considering the source and probable expectancy of findings.

III. Collections of specimens:

- | | |
|----------------|---|
| A. Equipment - | B. Media - |
| Spatulas | Dextrose infusion broth (blood culture) |
| Scissors | 5% blood plates |
| Pipettes | Infusion broth tubes |
| Culture tubes | 5% blood broth, infusion |
| Forceps | Eosin methylene blue plate) feces for |
| Swabs | Desoxycholate plate) typhoid- |
| |) dysentery |
| |) group |
| | Brewer's Thioglycollate tubes (anae- |
| | robes) |

C. Preparation of surface: Sear all surfaces which must be entered, using two applications of heated spatula.

D. Except for heart blood, transfer all specimens to sterile dishes or tubes to be cultured outside of autopsy room.

E. Blood: Inoculate two plates (blood agar) with 1 cc. of blood and two flasks of dextrose infusion broth. Culture aerobically and anaerobically.

IV. Corps Area Laboratories are available when needed for final identification of referred isolations.

TOXICOLOGIC EXAMINATION

Lt. Col. C. J. Gentzkow, M.C. Army Medical School.

Toxicologic analysis, especially of body fluids and tissues, is work for an expert and should never be undertaken except by those having special training and experience, since the life or liberty of others may depend upon the result.

The rough quantitative testing in cases of suspected poisoning sometimes attempted by medical men with little or no experience in chemical analysis, is most unwise for it uses up the irreplaceable material and may lead to a miscarriage of justice.

I. The Clinical History

The importance of a careful complete history, obtained from the patient, his relatives or friends, together with a most searching physical examination, cannot be too strongly stressed. The toxicologist in justice to his work and to himself must insist upon being supplied with the fullest information possible and especially with those facts pointing to the type or class of poison involved.

A good history should include:

1. The interval between taking the last food or drink and
 - a. The first appearance of symptoms of poisoning;
 - b. Death, if this has occurred.
2. The nature of the first symptoms.
3. Whether any of the following symptoms were present and, if so, which ones and the time of occurrence.
 - a. Vomiting and/or purging;
 - b. Deep sleep;
 - c. Tingling of skin and throat;
 - d. Convulsions or twitching of the muscles;
 - e. Delirium and clutching at imaginary objects.
4. The nature of any other symptoms noticed.
5. Whether any other person partook of the suspected food or drink and whether they also suffered from symptoms of poisoning.
6. Any other available information likely to prove serviceable as a guide to the class of poison administered.

In all cases a search should be made of the room or other immediate surroundings for the remains of food or drink, medicines, bottles, drinking glasses, hypodermics, etc., any of which may provide evidence of the nature of the poison.

Many diseases produce symptoms which are identical with those caused by poisons, and differentiation is usually difficult, until careful study has been made.

As an aid in differentiation, the following list of symptoms common to both disease and poisoning, with the diseases and poisons causing them, is given. However, it must be borne in mind that unusual symptoms may be produced in an individual by various poisons, just as unusual symptoms may occur in any disease.

VOMITING: Frequently associated with purging and abdominal pain.

Poisons: Arsenic, antimony, aconite, corrosive acids and alkalies, barium, colchicum, cantharides, digitalis, copper, iodine, mercury, phosphorus, phenols, alcohols, veratrum, zinc, poisonous foods.

Diseases: Gastritis and enteritis, gastric and duodenal ulcer, cholera, uremia, acidosis, onset of many infectious diseases, early pregnancy, brain tumor.

CONVULSIONS:

Poisons: Aspidium, brucine, camphor, cyanides, santonin, strychnine.

Diseases: Uremia, eclampsia, tetanus, epilepsy, many acute diseases of the cerebrospinal system, especially meningitis.

COMA:

Poisons: Opium and its alkaloids and derivatives, chloral, sulphonal, trional, tetronal, veronal, luminal, paraldehyde, chloroform, cyanides, CO, CO₂, atropine, hyoscine, scopolamine, the various alcohols and phenols.

Diseases: Uremia, eclampsia, acidosis, cerebral hemorrhage, cerebral embolism and thrombosis, brain injuries, epilepsy and other brain diseases.

DILATATION OF PUPIL:

Poisons: Belladonna and its derivatives, hyoscyamine, stramonium, gelsemium, cocaine, nicotine.

Diseases: Those causing optic atrophy, sympathetic irritation, or oculo-motor paresis.

CONTRACTION OF PUPIL:

Poisons: Derivatives of opium, physostigmine, pilocarpine, muscarine.

Diseases: Tabes and certain other diseases of central nervous system.

GENERAL OR PARTIAL PARALYSES:

Poisons: Cyanides, CO, CO₂, botulism.

Diseases: Apoplexy, brain tumor, meningitis.

SLOW RESPIRATION:

Poisons: Opium and its derivatives, CO, hypnotics.

Diseases: Uremia, compression of brain from any cause, i.e. hemorrhage.

RAPID RESPIRATION:

Poisons: Atropine group, cocaine, CO₂.

Diseases: Acute respiratory diseases, lesions of medulla, hysteria.

DELIRIUM:

Poisons: Atropine group, cocaine, cannabis indica.

Diseases: Epilepsy, insanity, delirium tremens, organic brain diseases such as meningitis, encephalitis, etc., nephritis, etc.

DYSPNEA:

Poisons: Strychnine (during the convulsions), cyanides, CO.

Diseases: Those of cardiac and respiratory systems, lesions of medulla and of vagus.

CYANOSIS:

Poisons: Nitrobenzene, aniline, acetanilide, opium.

Diseases: Same as dyspnea, prolonged convulsions due to any cause, by producing cardiac embarrassment or dilatation.

The careful consideration in connection with the symptoms, of certain concomitant circumstances or conditions will often enable the physician to arrive at a conclusion of presumable accuracy, and sometimes to make an indisputably correct diagnosis.

The presence on the lips and tongue or in the throat of marks of corrosion and the occurrence in the vomitus of shreds of mucosa, leads of necessity to the conclusion that a corrosive poison of some kind has been swallowed. The odor of the breath frequently discloses beyond a doubt that phenol, or chloroform, or preparations of crude opium, etc. have been taken. Careful examination of vomitus or stomach washings and in some cases

of the feces, may give important evidence, such as the odor of phenol, of cyanides, or laudanum, the luminosity of phosphorus in the dark, the presence of crystals, especially if colored, i.e., the colored salts of arsenic and mercury.

The following rules are of great assistance in distinguishing acute poisoning from disease:

1. In poisoning, the symptoms usually appear suddenly and generally when the patient is in good health.
2. They commonly make their appearance after the taking of food, drink or medicine.
3. If several persons take the same food or drink, all will show similar symptoms.

All of the pertinent information so obtained must be given first to the pathologist, in case of death and autopsy, and, secondly, to the toxicologist. Give the toxicologist all available information whether you consider it important or not. Suggest, if you wish, search for any particular poison or group of poisons to which the symptoms and physical findings point, but furnish complete data to the analyst, nevertheless, and let him also deduce from such facts the probable type of poison implicated.

II. The Autopsy

In all poisoning cases a complete autopsy is necessary, not only to determine if lesions due to poisons are present but also to rule out natural causes of death. It is far more satisfactory if the autopsy is done prior to embalming since the formaldehyde in the embalming fluid interferes with tests for cyanides, carbon monoxide, phenols, and methyl alcohol and with the color reactions for alkaloids. Putrefaction also interferes with the detection of alkaloids.

1. Supplies and Equipment.

In addition to the usual instruments and equipment, there must be kept on hand an adequate number of chemically clean glass specimen jars and glass-stoppered bottles. Glass-topped Mason jars of the spring type and wide and narrow-mouthed glass-stoppered bottles of various sizes are satisfactory. After thorough scrubbing with soap and hot water, they should be rinsed and then placed in the dichromate-sulfuric acid cleaning solution for several hours or longer, rinsed with at least 10-12 changes of hot tap water and finally with 2 or 3 changes of distilled water, dried and stoppered.

2. Autopsy Technic

The usual thorough inspection of the body should be made even more detailed and searching if poisoning is suspected. Careful examination of lips, tongue and mucosa of mouth and throat must be made for

evidence of corrosive action. The condition of the pupils, extent and degree of rigor, presence and character of odors, should be noted. Search should be made for puncture marks of hypodermic needles and if found, the tissues in that immediate area should be dissected out and saved for examination.

Any orderly, systematic method of prosection is acceptable, but it is advisable to open the abdomen first and observe the organs in situ before opening the chest in order to prevent the admixture of blood and pleural fluid. Note the position, fullness, color, odor, etc., of all abdominal viscera.

If the method of block dissection is followed, be sure to tie off at the esophagus and anus and to secure the required blood and urine samples prior to removal of the viscera en bloc.

III. Selection, Preservation and Forwarding of Specimens.

1. Taking the Specimens

In cases where death has occurred within a very short time following the ingestion of a poison, only the stomach and intestinal contents are required for examination.

In all other cases, and where any doubt exists as to the nature of the toxic agent, route of administration and time of death in relation to time of administration, the stomach and its contents, part of the intestine and its contents, brain, heart, lung, liver, kidney, spleen, blood, urine, spinal fluid, muscle, bone and hair specimens should be taken as indicated by the history and symptoms.

The stomach and contents should be placed in one jar, intestine and contents in another. Blood, urine, spinal fluid and other liquid specimens may be placed in glass-stoppered bottles. A single container may be used for the other solid viscera.

Weigh all viscera carefully before taking the specimens, for this weight is required in quantitative work.

As soon as a specimen is placed in a container, close and label it, giving all information required to fully and completely identify the specimen.

When all are taken, wrap each container in heavy paper, tie it and then seal top, bottom, free edge and knot with sealing wax. Mark the wax with some distinctive device in such a manner that tampering would be immediately evident. Keep all specimens so prepared in your immediate possession or safely locked up until they are shipped or otherwise delivered to the toxicologist.

It is needless to say that the greatest care must be exercised to prevent contamination of the specimens in the autopsy room itself.

2. Preservatives

When specimens must be shipped to a distant laboratory for toxicologic examination, some method of preservation must be used.

Refrigeration is by far the best method and may be accomplished by the use of ice, or better still with solid carbon dioxide or "dry ice" as it is commonly called. Using "dry ice" which may be secured at most ice cream and packing plants, pack the jars in a heavy cardboard container. Place the solid CO₂ in paper bags on top of the specimens, and seal the package with strips of gummed paper. Specimens can be kept in perfect condition for 72 hours by this method.

If ordinary ice is used, ship by express, making arrangements for re-icing en route.

When a chemical preservative must be used, ethyl alcohol U.S.P. 95% is to be preferred. Use only enough to accomplish the purpose and send along a generous sample of the alcohol used so that it may be tested for extraneous substances. This must not be used when one of the poisons in question is ethyl alcohol or any other alcohol.

Only in cases of poisoning by heavy metals is it permissible to use formaldehyde.

3. Specimens from Living Cases

Handle specimens from living cases in the same manner. Above all, be generous with the samples; send all of the vomitus, stomach washings, urine, suspected food or drink, etc. and give the toxicologist all available information about the case.

4. Specimens Best Suited for Particular Poisons

- a. Gastric and Intestinal Contents: For any poison taken by mouth when death has occurred within a few hours.
- b. Brain: For alcohols, chloroform, ether, alkaloids, barbiturate group, benzene.
- c. Liver: Metals, barbiturate group, fluorides, oxalates, sulfonal.
- d. Kidney: Metals, especially mercury.
- e. Blood: All gaseous poisons, drowning (see below).
- f. Bone: Lead, arsenic, radium (especially chronic poisonings).
- g. Lung: For inhaled poisons and to prove whether poison entered by inhalation.

h. Urine: Barbiturate group, sulfonal, metals.

Note: If the deceased lived for several days following the intake of a volatile poison, such as cyanide, chloroform and ethers, it would not be detectable in autopsy material.

5. Specimens from Cases of Suspected Drowning

Take specimens of blood from the right and left sides of the heart, using pipettes with relatively large openings and being careful not to perforate the septum. Label the bottles "left heart" and "right heart". Secure a specimen from the body of water in which the person was drowned.

By chloride analysis of the three specimens, drowning can be proved or disproved.

6. Forwarding Specimens, History and Autopsy Protocol

Send all specimens for toxicologic analysis to the Army Medical School, Army Medical Center, Washington, D.C., and not to the Army Medical Museum. The Quartermaster will ship material on Government bill of lading using the same purpose number as for shipments to the Army Medical Museum.

Collect and send separate specimens of tissue to the Army Medical Museum for histopathologic examination.

All specimens for toxicologic examination must be accompanied by a full and complete history and in case of death by a complete autopsy protocol, as well as by the proper requests for examination.

PROCEDURE FOR OBTAINING AND TRANSMITTING BRAIN TISSUE
FOR VIRUS IDENTIFICATION IN CASES OF ACUTE NON-SUPPURATIVE
ENCEPHALITIS.

1. Remove the brain with as little contamination as possible. The brain should be removed before the thorax and abdomen are opened to prevent possible virus contamination from the viscera.
2. Take generous blocks from (1) temporal lobe including hippocampus, (2) motor cortex, (3) midbrain, (4) thalamus, (5) pons and medulla, (6) cerebellum, (7) cervical cord.
3. One block of tissue from each situation is placed in a sterile container with at least 100 cc. of sterile buffered 50% glycerol and mailed immediately direct to the "VIRUS LABORATORY, ARMY MEDICAL SCHOOL", Washington, D.C. Do not send to the Army Medical Museum.
4. The sterile buffered glycerol is obtained from Corps Area and General Hospital laboratories. In case the buffered solution is not available, a 50% solution of glycerol in normal saline should be used.
5. Duplicate tissue blocks taken from the above indicated 7 situations or the remainder of brain are fixed in 10% formalin and sent to the Army Medical Museum.

OFFICE OF THE SURGEON GENERAL

WAR DEPARTMENT

WASHINGTON

CIRCULAR LETTER NO. 1 JAN. 2, 1941

The following extract from Circular Letter No. 1, January 2, 1941, is furnished with additions for the information and guidance of all concerned:

24. Tissue pathology.

A. Tissue.

1. Tumor tissue. When surgical or biopsy material suggests tumor, when the diagnosis is in doubt or when the case is of particular interest, the Army Medical Museum will be furnished either direct by the post surgeon or by the laboratory making the initial examination: a. Microscopic slides, if available. b. Paraffin blocks, if available. c. Representative pieces of the actual "wet tissue". The material (a-b-c above) will be accompanied by MD Form 55W or M properly completed and an abstract of the clinical record of the case. The main reason for supplying the Army Medical Museum with complete data and tissue is to centralize all information of the case. This is necessary in the army because of the constant shifts of personnel and patients, and it also facilitates "follow-up" of cases.

2. Emergency diagnosis. When the welfare of a patient demands a histopathologic diagnosis at the earliest moment and when local facilities for such procedure are not available, representative portions of tissue will be sent to the nearest general hospital, corps area or department laboratory, or direct to the Army Medical Museum. If the laboratory to which a specimen is first sent is not equipped to render an authoritative diagnosis, the officer in charge will forward the case to the Army Medical Museum without delay. Report will be furnished by the Museum by radio on request.

3. Autopsy material. In every case representative portions of all organs will be placed in 10% formalin (made by diluting one part commercial formaldehyde with nine parts of tap water). Where facilities are available the tissue will be prepared and sectioned and the results of the histopathological examinations included in the protocol. In all cases "wet tissue" comprising representative pieces of all organs, including skeletal muscle and bone marrow, where indicated, and new growths, if present, will be forwarded to the Curator of the Army Medical Museum, accompanied by a copy of the protocol of the autopsy and abstract of clinical record (see par. 20, AR 40-410). If there is a reason for an early report by the Museum as when board proceedings are dependent on it, the case should be marked "rush".

4. An autopsy protocol is complete when it includes: a. The clinical data relative to the case. b. The gross autopsy findings. c. The results of the microscopic examination of the various tissues of the body including new growths and metastases. In deaths from trauma (homicide, suicide, accidents, etc.) the circumstances will be accurately indicated. The identity of bodies autopsied, when not actual hospital cases, must be carefully verified and substantiated by affidavits or certificates of individuals knowing the deceased, or by fingerprints if no one knowing the deceased can be located.

5. A model for a satisfactory protocol will be furnished by the Curator, Army Medical Museum, to the surgeon of any station hospital requesting it to be used as a working model by medical officers inexperienced in the preparation of such documents.

The original copy of a protocol will be kept on file in the hospital laboratory; the registrar of the hospital, chief of the service having had charge of the case, and the Curator of the Army Medical Museum each being furnished a copy as soon as practicable after completion of the case. Additional copies may be distributed as authorized by the commanding officer of the hospital.

6. Fixation of tissue. Pieces of tissue not more than 1 cm. in thickness will be selected from representative parts of the specimens and fixed in approximately 20 times their volume of 10% formalin. The formalin solution will be changed the following day and again immediately before packing for mailing. Such tissue is designated "wet tissue".

7. Labelling "wet tissue" specimens. Individual specimens and groups of blocks of tissue should in all instances be accompanied by identification tags. The recommended type of tag is paraffinated linen tape. These are prepared by inscribing the identification number or the name of the patient on one-half inch linen tape with India ink. The tape is then dipped momentarily in melted paraffin, drained and cooled under tap water. The tags are attached to the gross specimen with needle and thread or inserted in the bottle with blocks of tissue.

8. Shipping "wet tissue" specimens. For mailing small fragments of tissue the double mailing case (item No. 41270) is satisfactory. The wide-mouthed bottle (item 40590 taking a No. 20 cord, item No. 77700) will prove satisfactory as it will fit in the mailing case. For protection it should be carefully surrounded with absorbent cotton. The label should be marked "First Class Mail, Rush, Specimen for Diagnosis". Shipments exceeding four pounds in weight will be made by express after having obtained procurement authority from the Curator of the Army Medical Museum, 7th St. and Independence Ave., S.W., Washington, D.C.

B. Gross Specimens.

1. The proper preparation of gross specimens, including an entire organ, groups of organs, or a tumor mass, so that the end result will be of value as a Museum specimen, requires considerable forethought and careful consideration of detail: (a) the solution necessary is Kaiserling I (see par. 11, AR 40-410); (b) the specimen must be placed at the start in the final position for mounting, because, after fixation has started, it will be impossible to rearrange the tissue so as to show the existing lesions to advantage; (c) the organ must be completely covered by the solution and should be kept in a dark place to avoid color changes; (d) the container used must be large enough to permit an adequate amount of solution to come in contact with all surfaces of the specimen and several large masses should not be included in one container; (e) the solution (K-I) should be changed at

least once before shipping. Thick, solid masses should either be injected with the fixative fluid or sliced so that the fluid can reach the interior. Procurement authority must be obtained from the Curator of the Army Medical Museum to cover expressage.

C. The Army Medical Museum.

1. The Army Medical Museum acts as a repository for surgical, biopsy, and autopsy material and maintains a laboratory for the diagnosis of tissue pathology. The functions of the Army Medical Museum include:

- a. Assembling and classifying material for instruction and research.
- b. Maintaining contact with pathologists of national repute for the purpose of obtaining consultation in obscure cases.
- c. The examination and diagnosis of surgical, biopsy, and autopsy material submitted by stations not having facilities for this work.

2. In addition, the Army Medical Museum maintains a photographic department for the preparation of photographs, photomicrographs, lantern slides, photostats of reports and medical documents, etc.

3. The military and professional value of the pathological material at the Army Medical Museum is dependent upon the degree with which officers of the Medical Department of the Army cooperate. Many of the younger medical officers do not know and therefore cannot appreciate the various purposes for which the Army Medical Museum is maintained; it is only by comprehension of the valuable professional services made so easily accessible, that complete cooperation may be obtained.

4. Registries. There are maintained at the Army Medical Museum the following Registries sponsored by national medical societies:

Ophthalmic pathology) American Academy of Ophthalmology
) and Otolaryngology.
Otolaryngic pathology)
Bladder and kidney tumors	American Urological Association.
Lymphatic tumors	American Association of Pathologists and Bacteriologists.
Dental and oral pathology	American Dental Association.
General tumors	American Society of Clinical
(particularly of endocrine glands)	Pathologists.
Dermal pathology	American Dermatological Association, Inc.
Lung and chest tumors	American Society of Thoracic Surgeons
Neuropathology	American Neurological Association and American Psychiatric Association

A case appropriate to any of these Registries is placed therein by the Curator and the officer submitting it is furnished an information blank which should be promptly completed and returned to the Museum. This Registry activity at the Museum is not only of great scientific value, but is very important to the Medical Department because of the wide contact made possible with eminent civilian specialists.

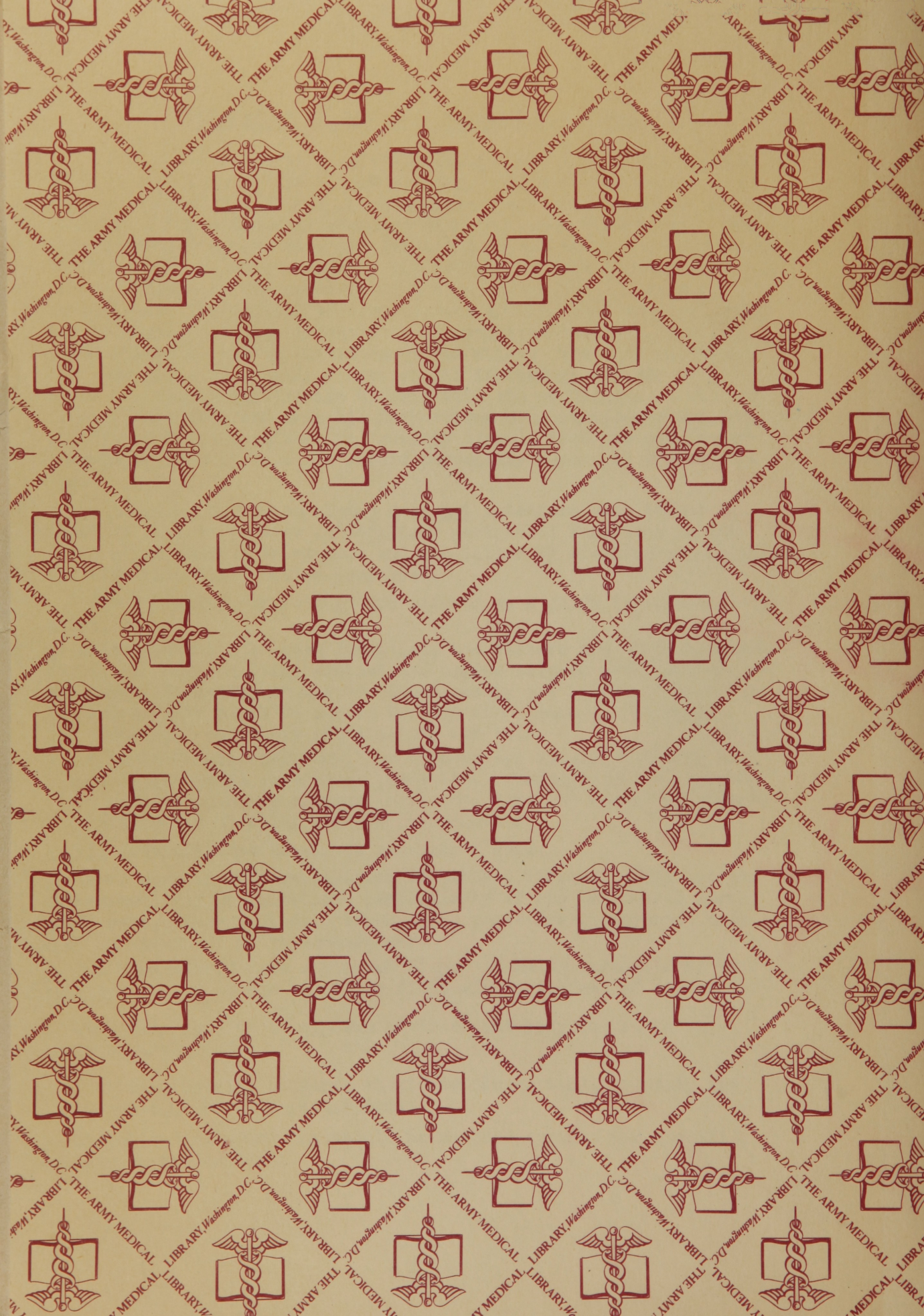
PREPARATION OF BODY FOR SHIPMENT AND BURIAL

It is a responsibility of the Medical Corps to see that bodies of deceased military personnel are properly embalmed and dressed and that the casket and shipping box conform with specifications of the contract made by the quartermaster with the local undertaker. Before the undertaker can receive pay for the services he must show a certificate which has been signed by the medical officer stating that all the conditions of the contract have been fulfilled. In signing this certificate, the medical officer assumes a very great responsibility and he should not sign it until he is satisfied that the body will reach its relatives in satisfactory condition. The duty of making the inspection is usually placed on the laboratory officer of the post. He should familiarize himself with the conditions of the contract, therefore, and make his inspections conscientiously and thoroughly. Until the officer can satisfy himself that the particular undertaker is competent, he should personally supervise the embalming.

Autopsying before embalming does not interfere with proper embalming; in fact, a more satisfactory peripheral embalming is secured after removal of viscera and the latter by slashing and thorough fixation can be the better preserved.

The following suggestions are offered as a guide to the final inspection:

- a. After the body has been autopsied, the viscera are to be properly fixed, the body cavities drained and organs covered with hardening compound. Incisions should be closed neatly and tightly with overlapping of skin edges to insure freedom from leakage in transit. The "baseball" stitch is satisfactory for this.
- b. In the non-autopsied body, the viscera are generally poorly embalmed by the usual peripheral injection. There should be evidence, therefore, of multiple trochar injections into the chest and abdomen. This will avoid bloating through putrefaction.
- c. All body orifices should be securely closed.
- d. There must be uniform fixation of surface tissues. This can be determined only by palpation, particularly of the peripheral parts, nose, ears, fingers, toes. If any soft parts are discovered, they must be "needled" by the undertaker.
- e. The skin should have a pinkish tinge. This is accomplished by coloring matter in the embalming fluid and by the use of cosmetics.
- f. Unsightly defects in exposed parts of the body should be properly reconstructed.
- g. Clothing, usually uniform, should be clean, tidy, properly applied and conform with regulations.
- h. Casket and shipping box should be checked against the specifications of the contract.



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